

TAXONOMY OF PASPALUM SETACEUM (GRAMINEAE)¹

DONALD J. BANKS

Department of Agronomy, Oklahoma State University, Stillwater

The *Setacea* paspalums, which are included in the *Monostachya* group of the section *Eupaspalum* by Pilger (1940), comprise ten species according to Chase (1929). They are most abundant in the southeastern United States and are of minor economic importance.

The most recent and comprehensive revision of North American species of *Paspalum* is Chase's (1929) in which she acknowledged taxonomic difficulty with *Setacea* taxa: "Some, such as the allies of *Paspalum setaceum*, form a network of closely related species . . . Most of the species of this group are rather poorly defined and appear to intergrade."

Previous studies were made with less material than is presently available and they utilized a morphological approach based largely on herbarium specimens. This revision, utilizing more material, is based on observations and data obtained on the anatomy, cytology, and morphology of the taxa from field, greenhouse, and herbarium investigations.

I wish to thank all of the persons from whom I received much valuable assistance during the course of this study. I specifically wish to thank the following persons: Dr. Wilbur H. Duncan, who served as my major professor, for advice, encouragement, and guidance throughout the study; Dr. Charles W. James, and Dr. Glenn W. Burton, committee members, for valuable suggestions; Dr. Jonathan J. Westfall and Dr. Ian Forbes, Jr. for advice on the cytological investigations. Thanks are due Dr. Alicia Lourteig of the Paris Museum and Dr. W. D. Clayton of Kew Gardens for important information about Michaux's Type Specimens of *Setacea* taxa. I also wish to thank the curators of the following herbaria for loan of specimens and photographs: AUA, Auburn University; DUKE, Duke University, FLAS, University of Florida; FSU, Florida State University, G, Conservatoire et Jardin Botaniques, Geneva, Switzerland; GA, University of Georgia; GH, Gray Herbarium; IA, University of Iowa; MO, Missouri Botanical Garden; NCU, University of North Carolina; NO, Tulane University; NY, New York Botanical Garden; OKLA, Oklahoma

¹Contribution No. 65 from the Stephen F. Austin State College Department of Biology. This paper is based on portions of a dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at the University of Georgia, May, 1963. Publication of this information was made possible by a Faculty Research Grant, Stephen F. Austin State College and a Grant-in-Aid of Research from the Society of Sigma XI.

State University; P, Museum National d'Histoire Naturelle, Paris, France; PH, Academy of Natural Sciences, Philadelphia; SMU, Southern Methodist University; TAES, Texas A & M University; TEX, University of Texas; UARK, University of Arkansas; US, U. S. National Museum; USF, University of South Florida. Abbreviations are from Lanjouw and Stafleu (1964).

HISTORICAL ACCOUNT

The oldest legitimate names of *Setacea* taxa are *P. setaceum*, *P. debile*, and *P. ciliatifolium* of Michaux (1803). Type specimens of these taxa are in the Michaux herbarium at Paris. Since 1803 at least 26 specific epithets have been applied to *Setacea* taxa. Author's concepts of the taxa show some trends in the classification of this group.

Chase acknowledged difficulty with *Setacea* in her revision and the complexity of the taxa was re-emphasized by her note attached to *P. ciliatifolium* (Swallen 10443, Rapides Parish, Louisiana [US]) that reads, "This 'ciliatifolium' is either a most variable species or several species. I struggled with it for N. Am. Pasp. and keep on struggling."

The most widely used manuals which include the majority of *Setacea* taxa are those of Small (1933), Fernald (1950), Hitchcock (1951), Gleason (1952), and Gleason and Cronquist (1936). Hitchcock's Manual is the most inclusive in regard to *Setacea* and Chase's concept is followed in it and in Small's Manual. Fernald's concept differs from Chase's primarily in recognizing some taxa as varieties. An excellent account of Fernald's views about the *Setacea* taxa is recorded in *Rhodora* (Fernald, 1934). However, Shinnars (1954) expressed dismay in trying to follow Fernald's treatment of *Paspalum ciliatifolium* for delimiting the Texas material. Gleason's and Cronquist's concepts appear to be intermediate between the concepts of Chase and Fernald.

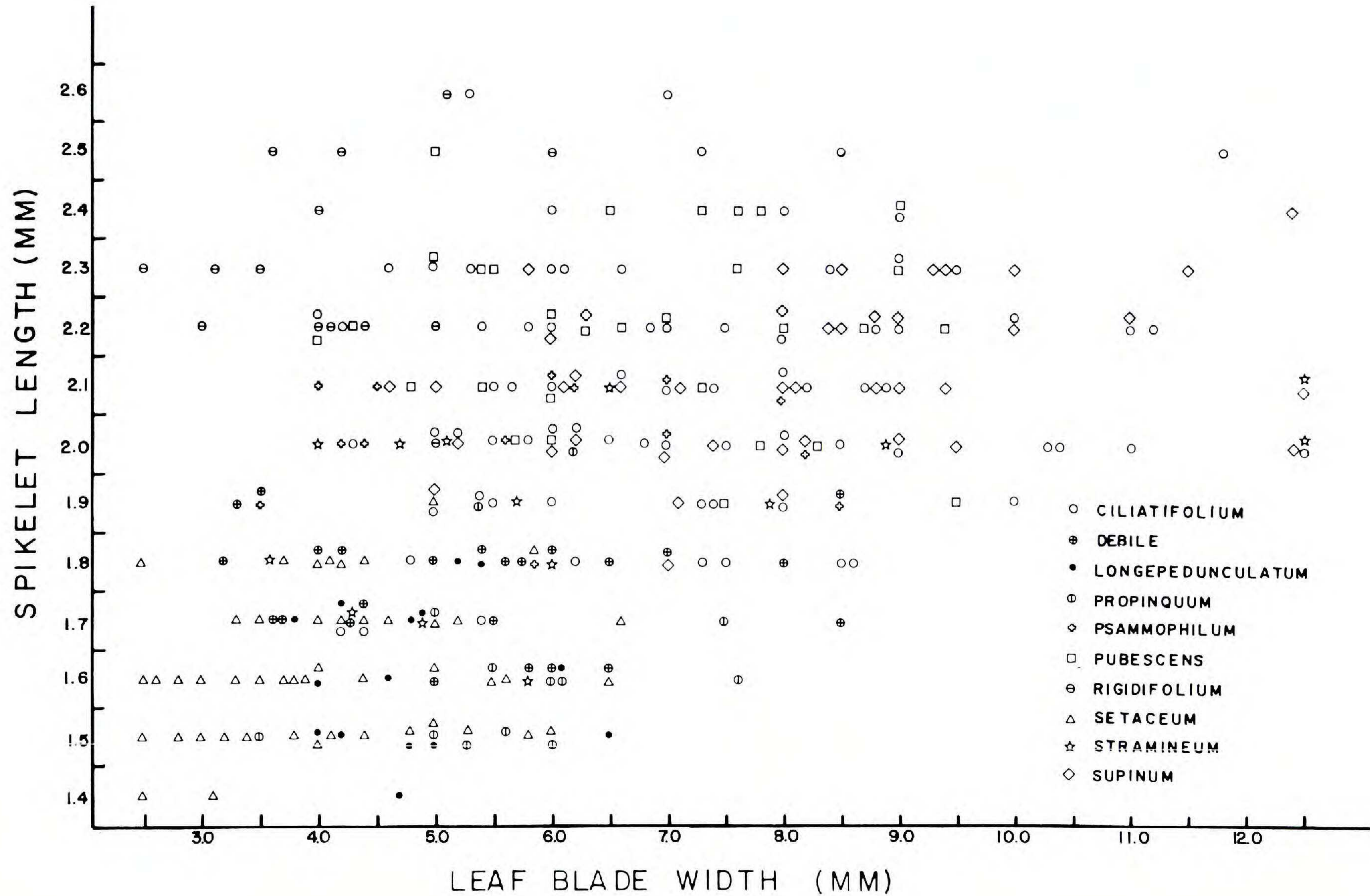
TAXONOMIC TREATMENT²

My studies have indicated that *Setacea* is a complex, highly variable group of plants which possess intergrading characters. Chase (1929) used spikelet length, leaf blade width, foliage pubescence, and growth habit

* A table comparing treatments by Chase, Michaux, Flüge, Poiret, LeConte, Elliott, Kunth, Gray, Wood, Vasey, Chapman, Nash, Fernald, and Gleason and Cronquist has been omitted on account of length and difficulty of fitting into our small page size. (*Editor's note.*)

² To conserve space, the lists of specimens examined are omitted. They were annotated and I have a list. I will be glad to furnish further information about them on request.

Figure 1. Scatter diagram of spikelet length and leaf blade width data of *Setacea* taxa from randomly selected herbarium specimens. Spikelet length computed by averaging the length of five primary spikelets from the middle of terminal racemes. Leaf blade width measured at the mid-point of mid-culm leaves. The specific names applied are according to Chase's (1929) concept as best as I could determine.



as principal characters for separating most species of *Setacea*. My studies have shown that spikelet lengths and leaf blade widths of the taxa are variable and frequently overlap. See Figure 1. Leaf pubescence appears to be fairly consistent and is often a good character for separating some taxa, but because of our knowledge of the inheritance of pubescence in other plant groups its value for specific recognition is questionable. Likewise, growth habit, which is variable, is questionable as a specific criterion.

Since the characters used most often to differentiate the taxa show various stages of intergradation, there seems to be justification for treating the group as a single variable species. The stronger trends that are defined more or less geographically might be treated better as varieties. Fernald (1934) proposed changes in the rank of some of the *Setacea* taxa based on the same reasons. This procedure has also been supported by Benson (1962). Apparently, Chase considered the possibility of reducing some of the species to lower rank because she remarked, "The entire *Setacea* group might be reduced to one or two species with subspecies, varieties, subvarieties, and forms, and the *Laevia* to another, but I do not see that greater definiteness would be gained thereby."

Because of the preponderance of evidence indicating the close relationships of the *Setacea* taxa and because of the intergradation of characters that best separate them, I believe it is best to recognize the *Setacea* group as a highly variable, polymorphic species consisting of several varieties showing some geographical trends. I have chosen to call the taxa varieties rather than subspecies. I have not felt the need to formally recognize any categories below variety. It should be noted however, that all the varieties are not necessarily of equal biological rank, but sufficient evidence as to the number and kinds of subgroups and their exact relationships is lacking at the present time. I have referred intergrading forms, which are numerous, to the varieties to which most of their characters correspond.

PASPALUM SETACEUM Michx. Fl. Bor. Amer. 1: 44 1803³

Yellowish green to green to purplish perennials with culms tufted, prostrate, spreading, ascending, or erect from a knotty base or short rhizomes, up to 90 cm tall; inflorescence terminal and axillary; racemes 3-17 cm long, slender, 1-5 on the terminal peduncles, usually single on the axillary ones, sometimes hidden in the leaf sheaths; spikelets usually in pairs, the lower sometimes absent, planoconvex, glabrous or pubescent, sometimes spotted, straw-colored to green to brownish to purple, elliptic to orbicular, 1.4-2.7 mm long, 1.0-2.0 mm wide; sterile lemma nerveless

³ Apparently, Flügge (1810) was the first author to unite Michaux's *P. setaceum*, *P. debile*, and *P. ciliatifolium* under one binomial, *Paspalus setaceus*. Therefore, if one accepts the concept that these taxa belong to a single species, the correct binomial becomes *Paspalum setaceum* Michx.

TABLE 1
VARIETIES OF PASPALUM SETACEUM

| 1. Var. <i>setaceum</i> | 2. Var. <i>longepedunculatum</i> | 3. Var. <i>villosissimum</i> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Grayish green, erect to spreading. | Yellowish green, erect to slightly spreading. | Grayish green, erect. |
| Leaf blades usually conspicuously erect or ascending, 2-7 mm wide, villous. | Leaf blades conspicuously basal, recurved, 3-8 mm wide, usually glabrous. | Leaf blades conspicuously basal, recurved, 3-10 mm wide, villous-hirsute. |
| Spikelets elliptic to sub-orbicular, 1.4-1.9 mm long, glabrous or pubescent, pale yellow to light green, sometimes spotted. Midnerve of sterile lemma often absent. (Figure 2) | Spikelets elliptic to obovate, 1.4-1.9 mm long, usually glabrous, brownish yellow to light green. Midnerve of sterile lemma absent. (Figure 3). | Spikelets elliptic to obovate, 1.5-1.9 mm long, pubescent, often spotted, brownish yellow to light green. Midnerve of sterile lemma absent. (Figure 4). |
| Coastal Plain; open ground, Massachusetts to Florida, westward to Texas. | Coastal Plain; open ground, North Carolina, Georgia, Florida, Alabama, and Mississippi. | Sandy fields and flatwoods, Florida and Cuba. |

to prominently nerved, first glume usually absent; fertile floret about the same size and shape as the spikelet, smooth and shining; leaf blades flat, ascending to spreading, glabrous to puberulent to coarsely pubescent, flexuous to rigid, 5-30 cm long, 2-20 mm wide; ligule a minute membrane with long white hairs back of it; leaf sheaths glabrous or pubescent, the lower ones often purplish brown..

Cytological evidence suggests that the species reproduces sexually. Meiosis in pollen mother cells is usually regular and the gametic chromosome number is 10 (Banks, 1964).

Paspalum setaceum is a variable, polymorphic species consisting of numerous races and forms. It is distributed in central and eastern United States, Mexico, Central America and the West Indies.⁴ Its greatest diversity of form is found in Florida.

Benson (1962) has suggested using a table rather than keys to segregate varieties of a species. Table 1 shows the characteristics of the best marked varieties of *P. setaceum*.

1. PASPALUM SETACEUM Michx., Fl. Bor. Amer. 1: 44. 1803. var SETACEUM.

[Type: South Carolina, *Michaux*, (P) not examined. Photograph (GA!).]

⁴ *Paspalum arenarium* Schrad. from South America appears to be a close ally of *P. setaceum* and may be only a variety. I have seen only a few herbarium specimens of it and do not feel qualified to pass judgment as to its proper disposition. Of the North American varieties of *P. setaceum* it appears to be closest to *longepedunculatum* and *villosissimum*.

TABLE 1 (Continued)
VARIETIES OF PASPALUM SETACEUM

| 4. Var. <i>psammophilum</i> | 5. Var. <i>stramineum</i> | 6. Var. <i>ciliatifolium</i> |
|----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Grayish green, spreading to prostrate. | Yellowish green to dark green, erect to spreading. | Dark green to purplish, erect to spreading. |
| Leaf blades 3-12 mm wide, densely puberulent, sometimes slightly pilose. | Leaf blades 3-15 mm wide, almost glabrous to puberulent and often pilose. | Leaf blades 3-20 mm wide, glabrous or essentially so. |
| Spikelets suborbicular, 1.8-2.2 mm long, pubescent, usually spotted, pale yellow to light green. Midnerve of the sterile lemma absent. (Figure 5). | Spikelets mostly suborbicular, 1.6-2.2 mm long, glabrous or pubescent, sometimes spotted, pale yellow to light green. Midnerve of the sterile lemma usually absent. (Figure 6). | Spikelets elliptic to suborbicular, 1.7-2.6 mm long, glabrous or pubescent, sometimes spotted, light green to green. Midnerve of the sterile lemma present or absent. (Figure 7). |
| Sandy soil; Massachusetts to District of Columbia. | Sandy soil; Minnesota to Michigan, to Arizona and Texas, along the coast to Florida, Black Belt of Mississippi and Alabama; Mexico to Panama; Bermuda and the West Indies. | Usually sandy soil, open ground; New Jersey to Florida, westward to Texas and Oklahoma; Bermuda and West Indies. |

?*Paspalum dissectum* Walt., Fl. Carol. 75. 1788. Not *P. dissectum* L. 1762.

Paspalum debile Michx., Fl. Bor. Amer. 1: 44. 1803.

Paspalum hirsutum Retz. Misapplied by Poir. in Lam. Encycl. 5. 28. 1804.

Paspalum dubium DC., Cat. Hort. Monsp. 130. 1813.

Paspalum leptostachyum DC., Cat. Hort. Monsp. 130. 1813.

Paspalum infirmum Roem. and Schult., Syst. Veg. 2: 307. 1817.

Paspalum incertum Roem. and Schult., Syst. Veg. 2: 308. 1817.

Paspalum eriophorum Willd. ex Nees., Agrost. Bras. 56. 1829.

In regard to most characters, this variety is usually the smallest. Robust, usually somewhat spreading plants, occurring throughout the range, are the form described as *P. debile*. Examples of these robust forms are: Ahles and Leisner 32807 (NCU), Scotland Co., North Carolina; Blomquist 13523 (DUKE), Carteret Co., North Carolina; Chase 6136 (US), Calvert Co., Maryland; Fernald and Long 10094 (US), Southampton Co., Virginia; Fults 1813 (US), Brunswick Co., North Carolina; Kral 7419 (FLAS, FSU, USF), Hernando Co., Florida; Latham 1 Sept. 1925 (US), Suffolk Co., New York; McFarlin 5121 (US), Polk Co., Florida; Nash 5 Sept. 1894 (NY), Washington D.C.; Norton 13 Aug. 1908 (US),

TABLE 1 (Continued)
VARIETIES OF PASPALUM SETACEUM

| 7. Var. <i>muhlenbergii</i> | 8. Var. <i>supinum</i> | 9. Var. <i>rigidifolium</i> |
|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Light green to dark green, mostly erect. | Yellowish green, stout, widely spreading. | Dark green to purplish, erect to spreading, conspicuously rigid. |
| Leaf blades 3-10 mm wide, pilose. | Leaf blades 4-15 mm wide, hirsute. | Leaf blades 2-6 mm wide, conspicuously rigid, glabrous or slightly puberulent. |
| Spikelets suborbicular, 1.8-2.5 mm long, usually glabrous, light green to green. Midnerve of the sterile lemma usually present. (Figure 8). | Spikelets elliptic to obovate, 1.8-2.4 mm long, glabrous or pubescent, light green. Midnerve of the sterile lemma present or absent. (Figure 9). | Spikelets elliptic to obovate, 2.0-2.6 mm long, glabrous or slightly pubescent, pale yellow to light green, sometimes purplish. Midnerve of the sterile lemma present or absent. (Figure 10). |
| Various provinces; New Hampshire to Florida, Iowa to Texas. | Coastal Plain; North Carolina to Florida to Mississippi. | Sand barrens, high pine land and flat woods; Georgia and Florida; Cuba. |

Dorchester Co., Maryland; Pearce 9 Aug. 1884 (US), Monmouth Co., New Jersey; Schallert 16184 (NCU), Seminole Co., Florida; Silveus 4556 (TEX), Camden Co., New Jersey; Wurzlow 13 Sept. 1914 (US), St. Tammany Parish, Louisiana.

Some intergrading forms resembling var. *muhlenbergii* occur scattered throughout the range but are most prevalent in the Carolinas. Examples are: Blomquist 10153 (DUKE), Robeson Co., North Carolina; Fredholm 6387 (GH, US), Hillsborough Co., Florida; Hitchcock 2343 Amer. Gr. Nat. Herb. No. 925 (GH, US), Orangeburg Co., South Carolina; Hitchcock 2446 (US), New Hanover Co., North Carolina; Oosting 2327 (DUKE), Carteret Co., North Carolina; Tracy 1890 (NY), Harrison Co., Mississippi.

Plants appearing to be intergrades of var. *setaceum* and var. *supinum* are especially notable in Florida. Examples are: Banks 1306 (GA), Lake Co.; Banks 1625 (GA), 1633 (GA), 1639 (GA), Santa Rosa Co.; Banks 1728B (GA), Taylor Co.; Banks 1754 (GA), Citrus Co.

In southeastern Texas there are plants which I have referred to var. *stramineum* that approach var. *setaceum* in general appearance. Examples of these plants are discussed under var. *stramineum*.

2. PASPALUM SETACEUM Michx. var. LONGEPEDUNCULATUM (LeConte) Wood, Class-book. 782. 1861.

Paspalum longepedunculatum LeConte, Jour. Phys. Chym. 91: 284. 1820. [Type: North Carolina, LeConte, (PH!).]

This variety is characterized by its small, usually glabrous, spikelets, and basally clustered, recurved, glabrous (except for the conspicuous ciliate margins) leaf blades. Many intergrading forms between this and var. *ciliatifolium* exist. These forms have been referred to var. *ciliatifolium* and will be discussed there as well as the forms described as *P. kentuckiense* having some of the characteristics of var. *longepedunculatum*.

Var. *villosissimum* appears to be closely related to var. *longepedunculatum* and some intergrades occur in Florida. The specimen Ray, Lake-la, and Patman 10169 (US, USF), Manatee Co., Florida, with pubescent leaf blades appears to be an intergrade of these varieties.

3. *PASPALUM SETACEUM* Michx. var. **villosissimum** (Nash) D Banks, comb. nov.

Paspalum villosissimum Nash, Bull. Torrey Club. 24: 40. 1897.

[Type: Eustis, Lake Co., Florida, Nash 946 (NY!). Isotypes (GH! MO! NY! US!)]].

This variety resembles var. *longepedunculatum* in most respects except it tends to be coarser, has more strongly developed rhizomes, and has villous-hirsute leaf blades. In the past, plants of this variety have been referred to *P. debile* which Michaux reported from Carolina and Georgia. I have referred these plants to var. *setaceum*, believing them to be robust forms of the latter. Plants resembling the type of *P. villosissimum* have not been collected north of Florida as far as I can determine. Therefore, it seems unlikely that *P. debile* and *P. villosissimum* could be synonymous.

4. *PASPALUM SETACEUM* Michx. var. **psammophilum** (Nash) D. Banks, comb. nov.

Paspalum prostratum Nash in Britton, Man. 74. 1901. Not *P. prostratum* Scribn. and Merr. 1901.

Paspalum psammophilum Nash in Hitchc., Rhodora 8: 205. 1906.

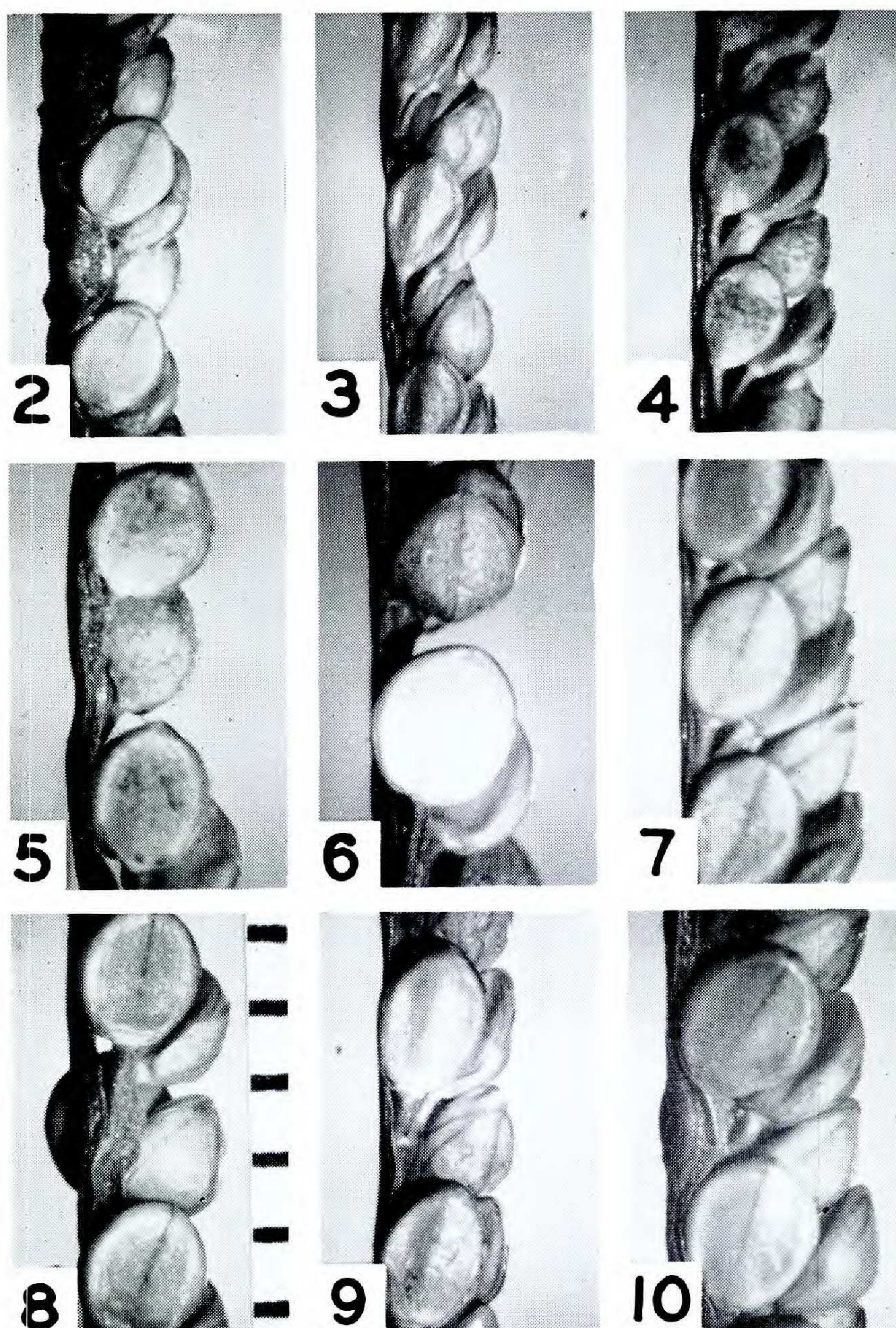
[Type: Kingsbridge, Bronx Co., New York, Nash 514 (NY!). Based on *P. prostratum* Nash].

This variety is characterized by its densely puberulent foliage and prostrate habit. Its northeastern distribution and its similarity to var. *stramineum* suggests that it is probably a disjunct from the latter possibly due to pleistocene glaciation. It appears to intergrade, but rarely, with var. *muhlenbergii*. Examples are: Bicknell 14 Sept. 1907 (NY), Nantucket Co., Massachusetts; Fernald and Long 17889 (GH), Barnstable Co., Massachusetts; and Scribner 16 July 1894 (US), Brookland, District of Columbia.

5. *PASPALUM SETACEUM* Michx. var. **stramineum** (Nash) D. Banks, comb. nov.

Paspalum chapmani Nash, Bull. N. Y. Bot. Gard. 1: 290. 1899.

Paspalum eggertii Nash, Bull. N. Y. Bot. Gard. 1: 434. 1900.



Figures 2-10. Spikelets of varieties of *Paspalum setaceum*. Scale in 1 mm graduations shown in Fig. 8. Fig. 2. *setaceum* (Banks 563, Dublin, Ga.). Fig. 3. *longepedunculatum* (Banks 1145, Eustis, Fla.). Fig. 4. *villosissimum* (Banks 1747, Lebanon, Fla.). Fig. 5. *psammophilum* (Banks 1459, Atsion, N. J.). Fig. 6. *stramineum* (Sander in 1962, Central City, Nebr.). Fig. 7. *ciliatifolium* (Banks 924, Wacissa, Fla.). Fig. 8. *muhlenbergii* (Banks 994, Echols Mill, Ga.). Fig. 9. *supinum* (Banks 910, Tallahassee, Fla.). Fig. 10. *rigidifolium* (Banks 1314, Silver Springs, Fla.).

Paspalum stramineum Nash in Britton, Man. 74, 1901.

[Type: Mullen, Hooker Co., Nebraska, Rydberg 1582 (NY!). Isotype (NY!).]

Paspalum bushii Nash in Britton, Man. 74, 1901.

Paspalum ciliatifolium Michx. var. *stramineum* (Nash) Fernald, Rhodora 36: 20. 1934.

Paspalum separatum Shinnars. Rhodora 56: 32. 1954.

This variety is quite variable in regard to size and pubescence. Plants nearly always have some puberulent hairs on the upper leaf blade (at least near the tip) and may or may not have pilose hairs as well. Chase (1929) referred the nearly glabrous forms to *P. ciliatifolium*, into which it appears to pass. She referred the smaller forms that extend into Mexico, Central America, and the West Indies to *P. propinquum*. To me, *P. propinquum* (which I have referred to var. *ciliatifolium*) appears to be an intergrade between var. *longepedunculatum* and var. *ciliatifolium*.

A few local intergrades between var. *stramineum* and var. *muhlenbergii* occur. Examples are: Langdon 245 (OKLA), Comanche Co., Oklahoma; and Schendel 170 (OKLA), Creek Co., Oklahoma.

In southeastern Texas some plants of var. *stramineum* resemble var. *setaceum* in appearance. Examples are: Bain 1068A (TAES), Brazos Co.; Griffiths 6383 (US), La Salle Co.; Hitchcock 5442 (US), Kenedy Co.; Johnson 930 (TAES, TEX), Karnes Co.; Owens 162 (US), Fayette Co.; Swallen 1469 (US), Cameron Co.; Swallen 1592 (US), Starr Co.; Swallen 10023 (US), Duval Co.; Swallen 10131 (US), Kleberg Co.; Swallen 10291 (US), Aransas Co.; Tharp 24 June 1941 (MO), Frio Co.; Tharp 3223 (TEX), Webb Co.; Tharp 5235 (US), Zavala Co.; Tharp 7653 (MO, NY, TAES, TEX, US), Calhoun Co.

6. *PASPALUM SETACEUM* Michx. var. *CILIATIOFOLIUM* (Michx.) Vasey, Contr. U. S. Natl. Herb. 3: 17. 1892.

Paspalum ciliatifolium Michx. Fl. Bor. Amer. 1: 44. 1803.

[Type: Carolina, Michaux (P) not examined. Photograph (GA!).]

Paspalum debile Muhl. Cat. Pl. 8. 1813. Descr. Gram. 91. 1817.

Paspalum spathaceum Desv. ex Poir. in Lam. Encycl. Sup. 4: 314. 1816.

Paspalum latifolium LeConte, Jour. Phys. Chym. 91: 284. 1820.

Paspalum ciliatifolium Michx. var. *brevifolium* Vasey, Proc. Acad. Phila. 1886: 285. 1886. Not synonymous with *P. setaceum* var. *brevifolium* Mertens ex Doell 1877—*P. arenarium* Schrad .

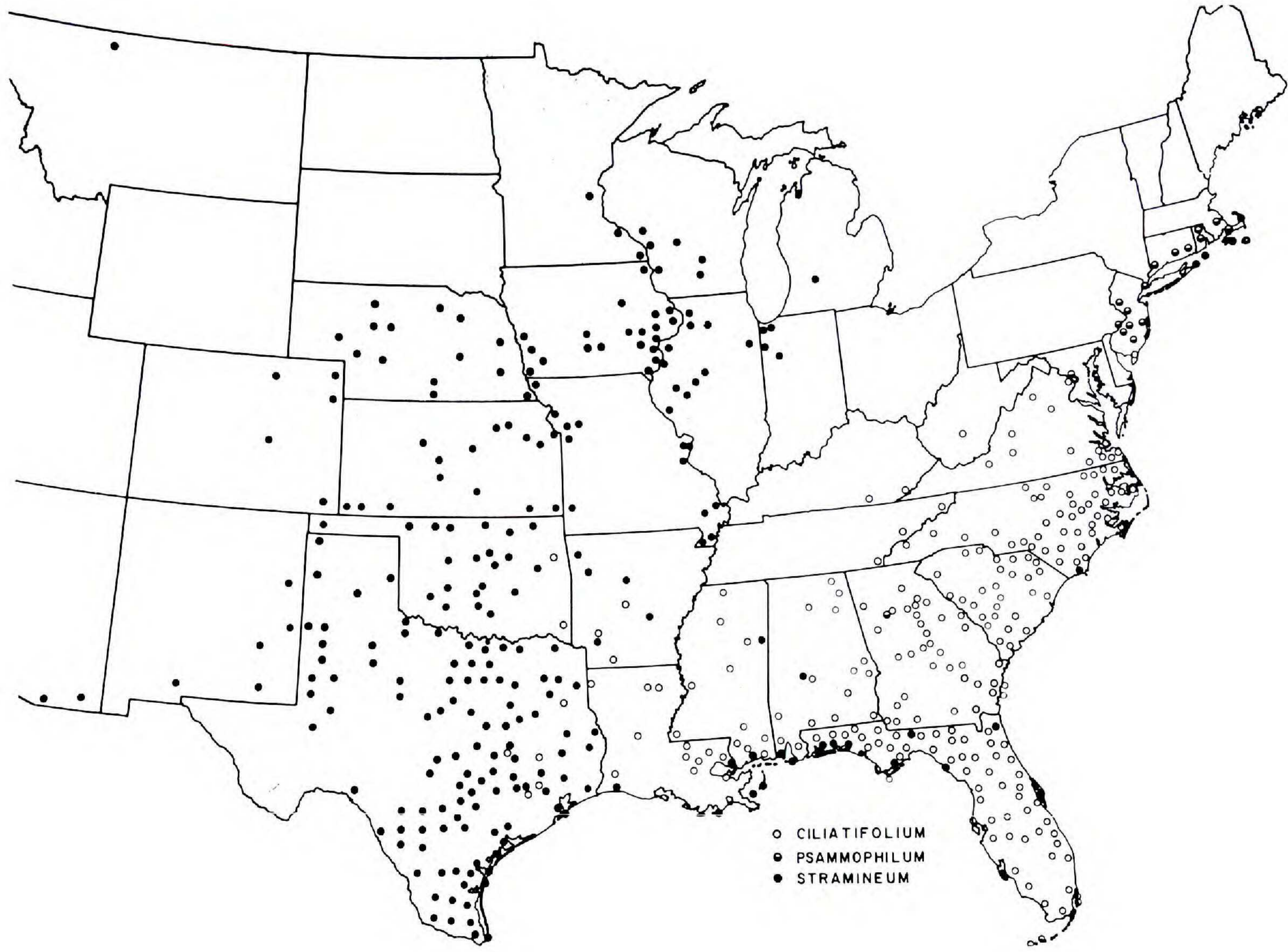
Paspalum propinquum Nash, Bull. N. Y. Bot. Gard. 1: 291. 1899.

Paspalum kentuckiense Nash in Britton, Man. 1039. 1901.

Paspalum blepharophyllum Nash in Small, Fl. Southeast. U. S. 71, 1326. 1903.

Paspalum epile Nash in Small, Fl. Southeast. U. S. 72, 1326. 1903.

This variety is the most variable. Some plants collected at the northern limit of its range are the form described as *P. kentuckiense*. These plants



resemble var. *longepedunculatum* because of their small spikelets and basally clustered leaves, but their ranges do not coincide. Examples are: Brown 22 Aug. 1942 (GH), Cape May Co., New Jersey; Chase 3009 (US), Arlington Co., Virginia; Fernald, Griscom, and Long 6469 (GH, USF), Isle of Wight Co., Virginia; Hitchcock Amer. Gr. Nat. Herb. No. 916 (GH, MO, NY, US, USF), Carter Co., Tennessee; Kearney 26 (GH, US), 56 (GH, MO, NY, US), Harlan Co., Kentucky; Killip 13244 (US), Orange Co., Virginia; Nuttall 4 Aug. 1892 (DUKE), Fayette Co., West Virginia.

The infrequent form described as *P. propinquum* appears to be an intergrade between var. *ciliatifolium* and var. *longepedunculatum*. Examples closely resembling the type specimen are Banks 1726 (GA), Taylor Co., Florida and Banks 1733 (GA), Dixie Co., Florida.

Intergrading forms between var. *ciliatifolium* and var. *rigidifolium* occur. Examples are: Banks 823 (GA), 826 (GA), 827 (GA), Santa Rosa Co., Florida; Banks 877 (GA), Walton Co., Florida; Banks 1362 (GA), Wheeler Co., Georgia; Banks 1617 (GA), 1630 (GA), Santa Rosa Co., Florida; Banks 1675 (GA), 1676 (GA), 1678 (GA), Baldwin Co., Alabama.

Some robust, spreading forms resembling var. *supinum*, except for their glabrous foliage, occur in Florida. These forms frequently grow sympatrically with var. *supinum*. Examples are: Banks 1720 (GA), Wakulla Co.; Banks 1723 (GA), 1730 (GA), 1731 (GA), Taylor Co.; Banks 1771 (GA), 1774 (GA), Pinellas Co.

7. *PASPALUM SETACEUM* Michx. var. ***muhlenbergii*** (Nash) D. Banks, comb. nov.

Paspalum pubescens Muhl. in Willd. Enum. Pl. 89. 1809.

Paspalum muhlenbergii Nash in Britton, Man. 75. 1901.

[Type: Van Cortlandt Park, Bronx Co., New York, *Bicknell* in 1896 (NY!).]

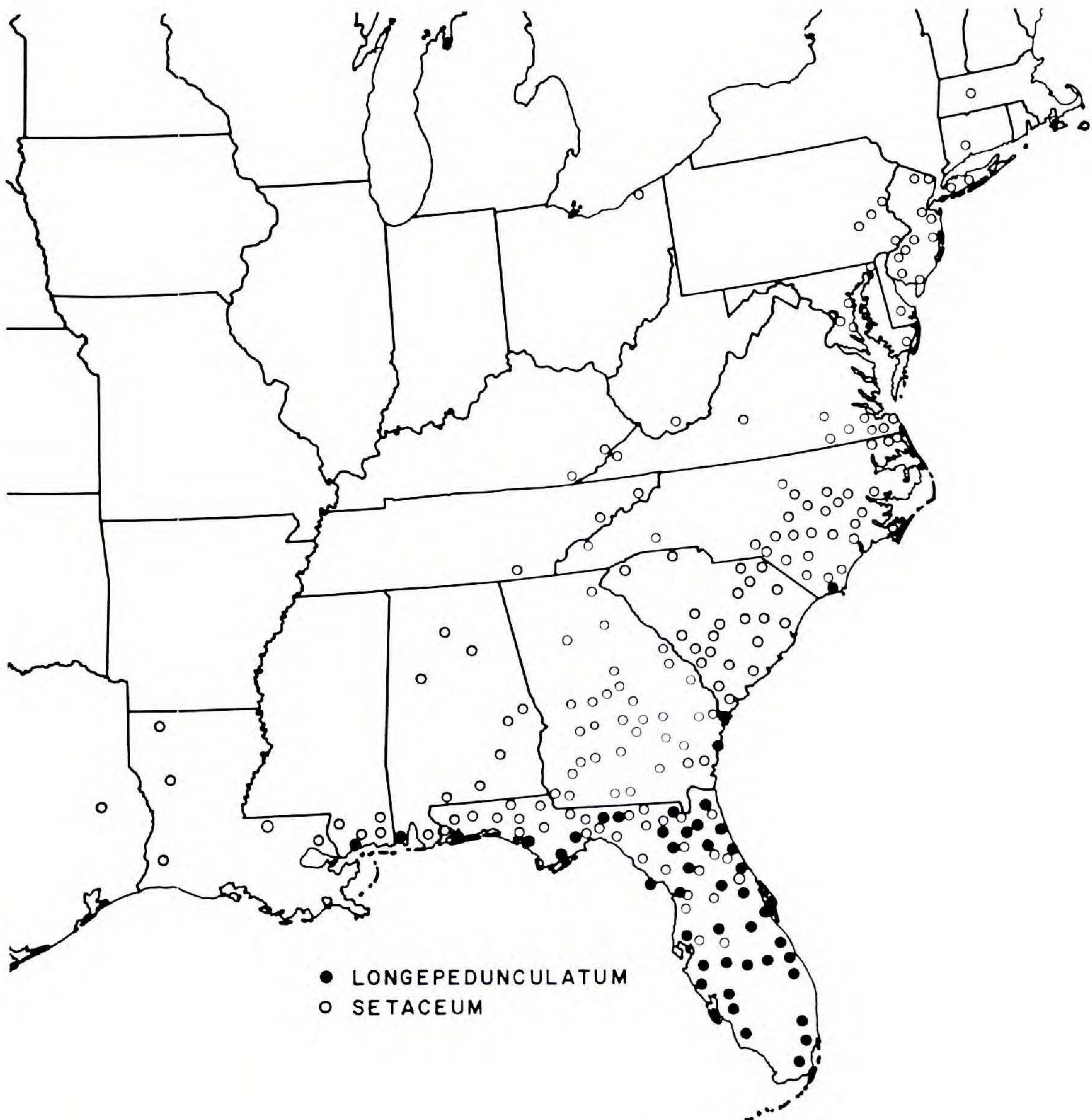
Paspalum pubescens Muhl. var. *muhlenbergii* House, Bull. N. Y. State Mus. 243-244: 39. 1923.

Paspalum ciliatifolium Michx. var. *muhlenbergii* (Nash) Fernald, Rhodora. 36: 20. 1934.

Paspalum setaceum Michx. var. *calvescens* Fernald, Rhodora. 49: 121. pl. 1057. 1947.

This variety closely resembles var. *ciliatifolium* except for its pubescent foliage. Their ranges overlap and if it were not for the more northern extension of var. *muhlenbergii* I would have united them.

Although most specimens have glabrous spikelets, some, like Mohr Sept. 1878 (US), Mobile Co., Alabama and Radford 35789 (NCU), Pamlico Co., North Carolina, have pubescent spikelets. The midnerve of the sterile lemma is characteristically present but the following have the midnerve absent: Blomquist 7461 (DUKE), Currituck Co., North Carolina; Blomquist 7481 (DUKE), Dare Co., North Carolina; Blomquist 10336 (DUKE), Carteret Co., North Carolina; Oosting Oct. 1934 (DUKE),



Durham Co., North Carolina; Radford 19425 (NCU), Montgomery Co., North Carolina.

Smaller plants of boggy areas, such as Fernald's type of var. *calvescens*, Fernald, Long, and Clement 15191 (GH), closely resemble var. *setaceum*.

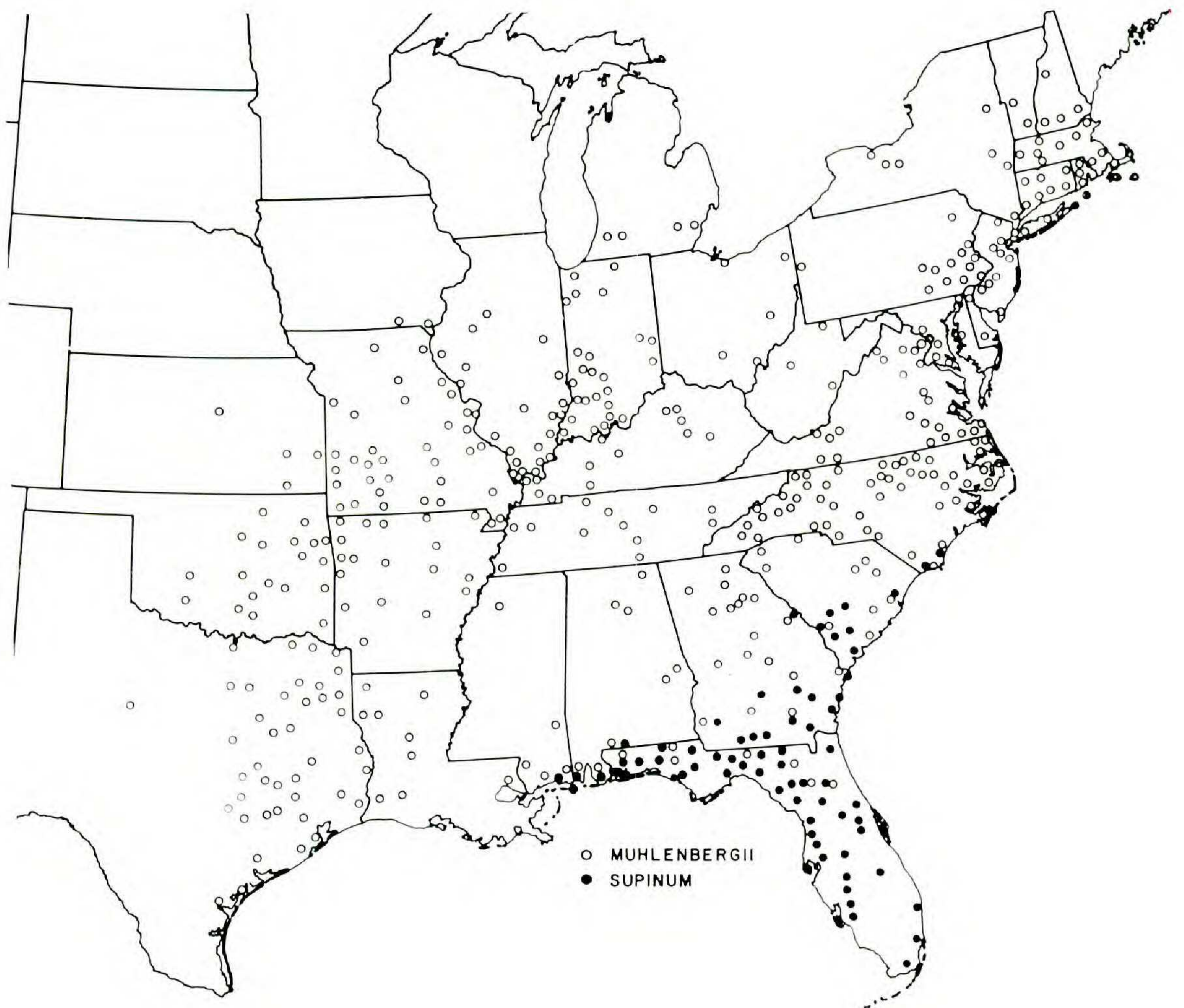
A few plants occur that resemble var. *rigidifolium*. For example: Kearney 292 (NY), Jackson Co., Mississippi; Pennell 4786a (NY), Ware Co., Georgia; Thorne 6438 (IA), Early Co., Georgia; Tracy and Ball 37 (TAES, US), Harrison Co., Mississippi.

8. *PASPALUM SETACEUM* Michx. var. *SUPINUM* (Bosc) Trin., Gram. Icon. 2: pl. 130. 1828.

Paspalum supinum Bosc ex Poir. in Lam., Encycl. 5: 29. 1804.

[Type: Carolina, Bosc, (P) not examined. Isotype (P!).]

Paspalum dasyphyllum Ell. Bot. S. C. and Ga. 1: 105. 1816.



Paspalum ciliatifolium Michx. var. *dasyphyllum* (Ell.) Chapm. Fl. South. U. S. ed. 3. 578. 1897.

This variety is best characterized by its coarse appearance, spreading habit, and hirsute pubescence.

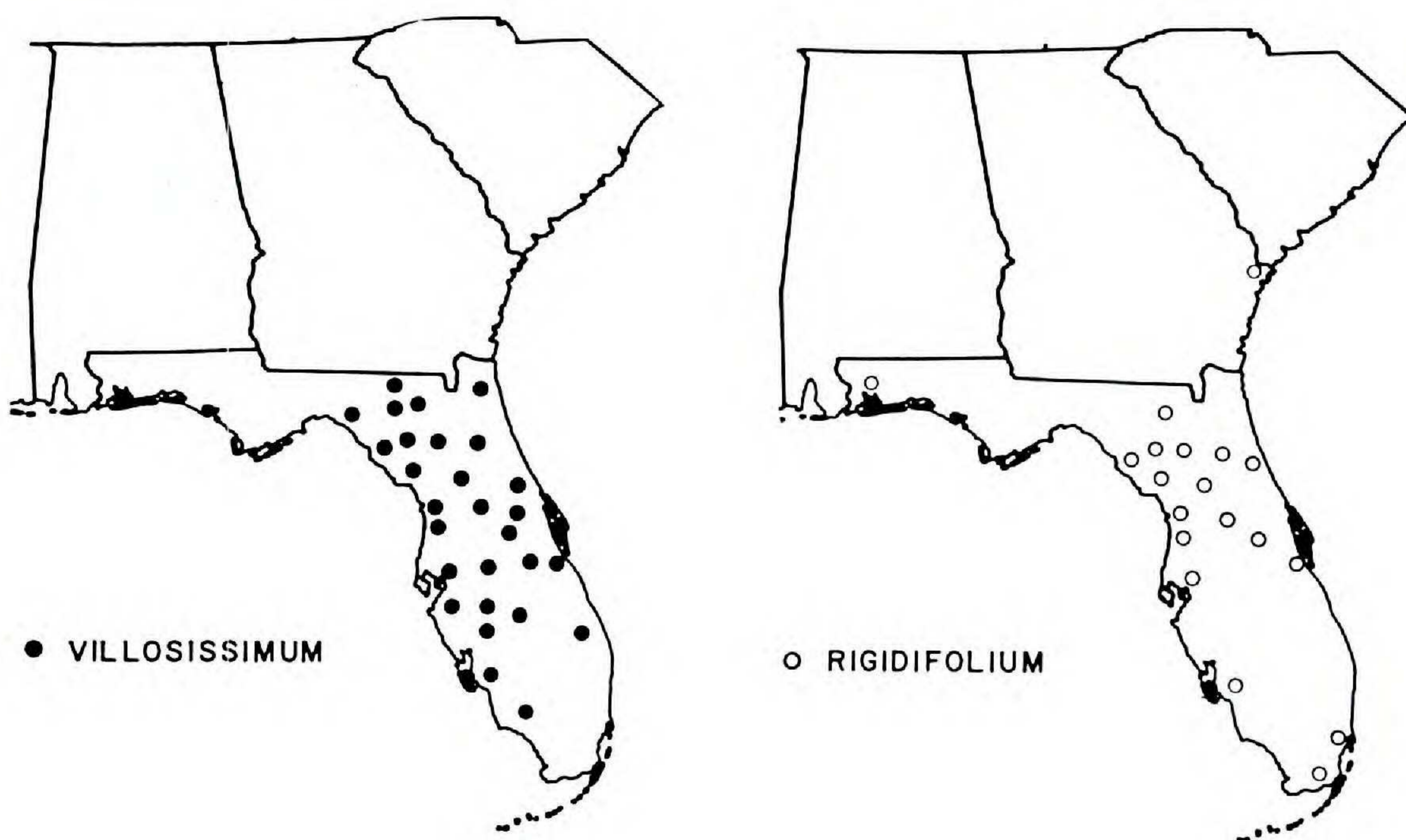
Although most plants of this variety tend to be spreading, some nearly erect forms scattered throughout the range occur. Examples are: Banks 1161A (GA), Hardee Co., Florida and Banks 1668 (GA), Jackson Co., Mississippi.

There are a few plants that are just slightly hirsute, resembling var. *ciliatifolium* in other respects. Examples are: Banks 962 (GA), Alachua Co., Florida; Banks 1261 (GA), 1262 (GA), Dade Co., Florida; Banks 1714 (GA), Calhoun Co., Florida.

Intergrading forms of var. *supinum* and var. *setaceum* have been observed. These were discussed under var. *setaceum*.

9. *PASPALUM SETACEUM* Michx. var. ***rigidifolium*** (Nash) D. Banks, comb. nov.

Paspalum rigidifolium Nash, Bull. N. Y. Bot. Gard. 1: 292. 1899.



[Type: Eustis, Lake Co., Florida, *Nash* 629 (NY!). Isotypes (MO! NY! US!)].

This variety is conspicuous because of its rigid habit, long narrow leaf blades, and large spikelets. Intergrades between var. *ciliatifolium*, var. *muhlenbergii*, and this variety occur. These intergrades have been discussed under the former varieties.

REFERENCES

- BANKS, D. J. 1964. Cytological studies in *Paspalum*, group *Setacea* (Gramineae). *Sida*. 1: 306-312.
- BENSON, L. 1962. Plant taxonomy methods and principles. Ronald Press, New York.
- CHAPMAN, A. W. 1897. Flora of the southern United States. 3rd ed. American Book Co., New York.
- CHASE, A. 1929. The North American species of *Paspalum*. *Contr. U. S. Natl. Herb.* 28(1): 1-310.
- ELLIOTT, S. 1821. A sketch of the botany of South Carolina and Georgia. J. R. Schenck, Charleston.
- FERNALD, M. L. 1934. Some transfers in *Digitaria* and *Paspalum*. *Rhodora* 36: 19-23.
- _____. 1950. Gray's manual of botany. 8th ed. American Book Co., New York.
- FLUGGE, D. J. 1810. Graminum monographiae. Pars 1. *Paspalus*. *Reimaria*. Perthes et Besser, Hamburgi.
- GLEASON, H. A. 1952. The new Britton and Brown illustrated flora of the northeastern United States and adjacent Canada. vol. 1. New York Botanical Garden. Printed by Lancaster Press, Inc., Lancaster, Pa.
- GLEASON, H. A. and A. CRONQUIST. 1963. Manual of vascular plants of northeastern United States and adjacent Canada. D. Van Nostrand, New York.
- GRAY, A. 1863. Manual of the botany of the northern United States. Ivison, Phinney, and Co., New York.
- HITCHCOCK, A. S. 1951. Manual of the grasses of the United States. 2nd ed. Revised by A. Chase. U. S. Govt. Printing Office, Washington.
- KUNTH, C. S. 1833. Agrostographia synoptica sive enumeratio graminearum. vol. 1. J. G. Cotta, Stutgardiae.

- LANJOUW, J. and F. A. STAFLEU. 1964. Index herbariorum, Part 1. 5th ed. Intern. Bur. Pl. Taxon., Nomen. Intern. Assoc. Pl. Taxon., Utrecht.
- LECONTE, J. 1820. Monographie des especes du genre *Paspalum*, existantes dans les Etats Unis d'Amerique. Jour. de Physique. 91: 283-286.
- MICHAUX, A. 1803. Flora boreali-americana. vol. 3. fratres Leverault, Paris.
- NASH, G. W. 1912. *Paspalum*. In North American flora. 17(2): 165-196. New York Botanical Garden, New York.
- PILGER, R. 1940. Angiospermae. Gramineae III. Band 14e. p. 59-60. In A. Engler and K. Prantl, Die Natürlichen Pflanzenfamilien. Wilhelm Engelmann, Leipzig.
- POIRET, J. L. M. 1816. *Paspalum*. In Lamarck, Encyclopedia Methodique. Supplement vol. 4. Paris.
- SHINNERS, L. H. 1954. Notes on north Texas grasses. Rhodora. 56: 25-38.
- SMALL, J. K. 1933. Manual of the southeastern flora. Univ. of No. Car. Press, Chapel Hill.
- VASEY, G. 1892. Monograph of the grasses of the United States and British America. Contr. U. S. Natl. Herb. 3(1): 16-17.
- WOOD, A. 1881. Class-book of botany. American Book Co., New York.